GLAST Large Area Telescope:

Technical Management and Open Technical Issues

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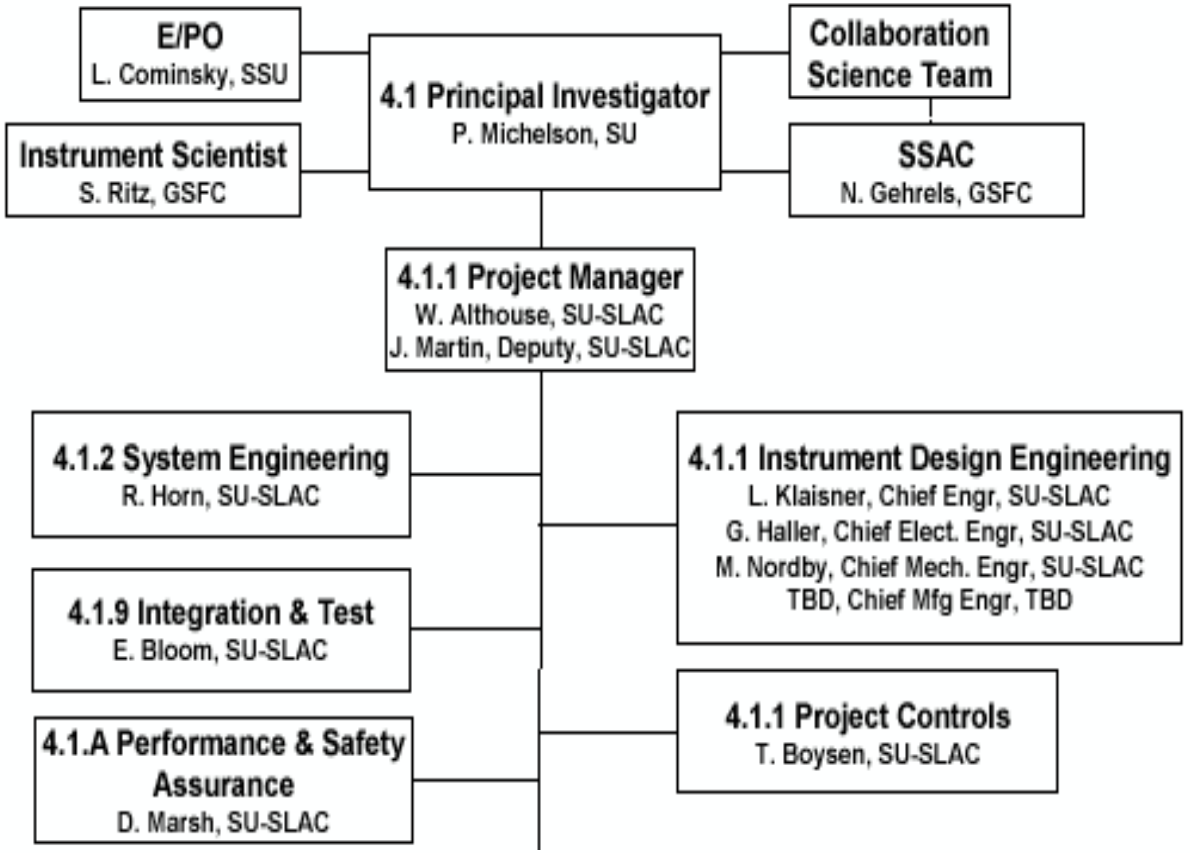
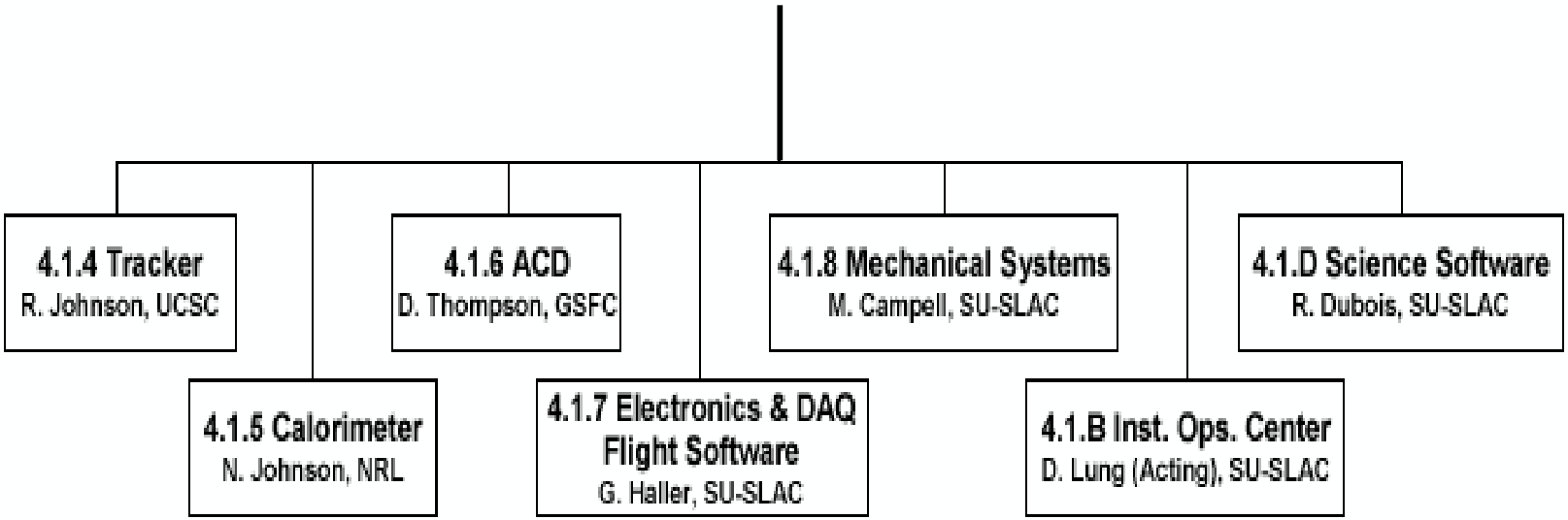
Outline

- Technical Management Organization
- Open Technical Issues
  - Tracker Bottom Tray
  - Calorimeter photodiodes
  - Application Specific Integrated Circuits (ASICs)
  - Other issues
- Scope of the design effort
- Engineering Model Deliverables
- Schedule
- Spacecraft
- Summary

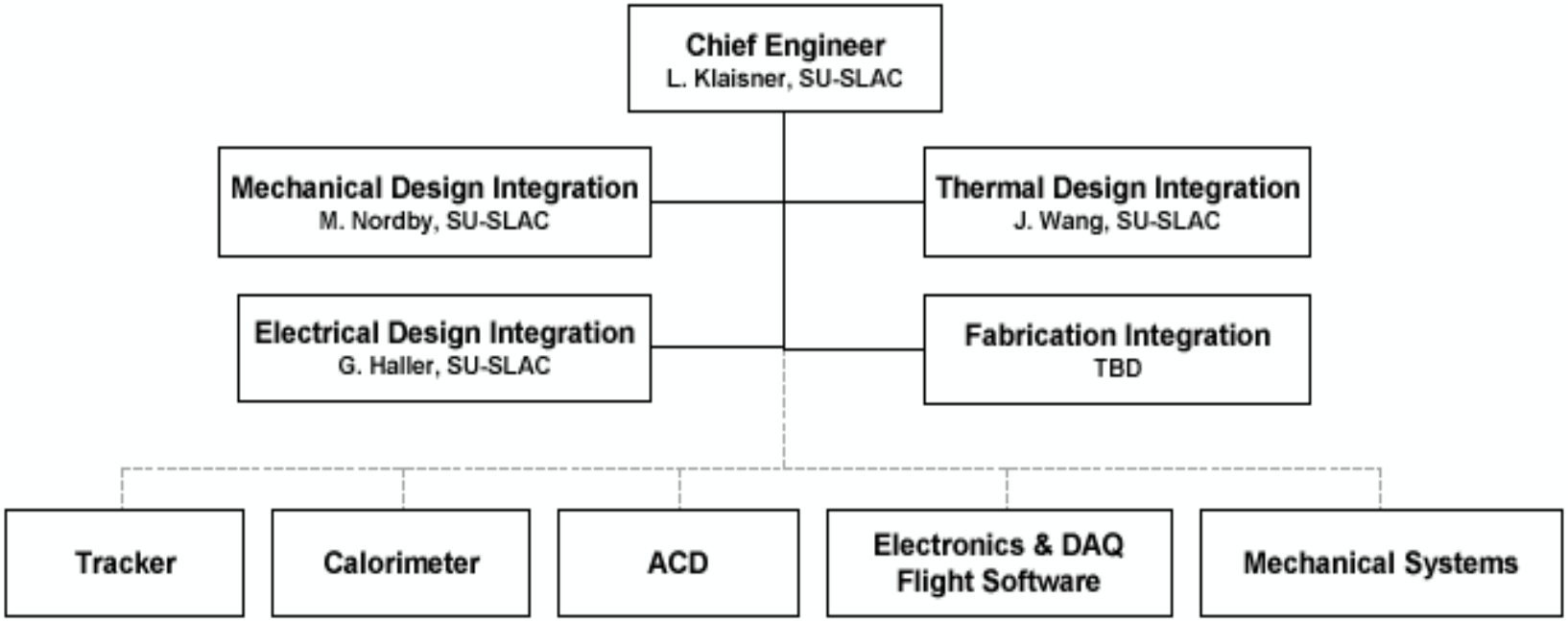
Tech Management – Project Office – 1 of 2



Tech Management – Project Office 2 of 2



Tech Management – Engineering Org



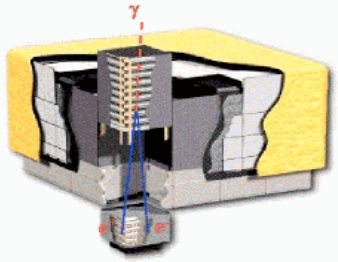
	Tracker	Calorimeter	ACD	Elect	Mech Sys
Mechanical	T. Borden	P. Dizon	K. Siegal	Tbd	M. Campell
Thermal	T. Borden	Tbd	L. Fantano	tbd	M. Campell
Electrical	R. Johnson	J. Ampe	G. Unger	D. Nelson	M. Campell

Tech Management – Engineering Meetings

GLAST banner.gif (16126 bytes) *The Gamma Ray Large Area Space Telescope*

LAT Design, Development, and Operations

[GLAST LAT Home | Other GLAST Links | Institutions | Directory of LAT Mailing List Subscribers | Phone Numbers]



WHAT'S NEW
Collaboration Mtg.
Oct 23-25, 2002

Delta Review
July 30 -Aug 1, 2002

Highlights
Bulletins

Project Management
Calendar
Email Calendar Changes
Organizational Chart
Project Controls

Reviews & Meetings
Future Reviews
Past Reviews
LAT Engineering Meetings
Collaboration Meetings

Documents
All Documents
Document Entry
Document Search
Frequently Requested
GLAST Mission Office

Subsystems
Tracker
Calorimeter
ACD
Electronics & DAQ
Mechanical
Integration & Test
Quality Assurance
Science Analysis Software
EPO

Instrument Design Team
Face to Face Meeting I
Face to Face Meeting II
Weekly IDT Meetings

Data Analysis
Test Beam
Balloon Flight
LAT Analysis Group

LAT Team Science Working Groups
Dark Matter
Diffuse Radiation
Extragalactic Sources
Galactic & Unidentified Sources
Transients:
Gamma-Ray Bursts and Solar Flares

Web Masters

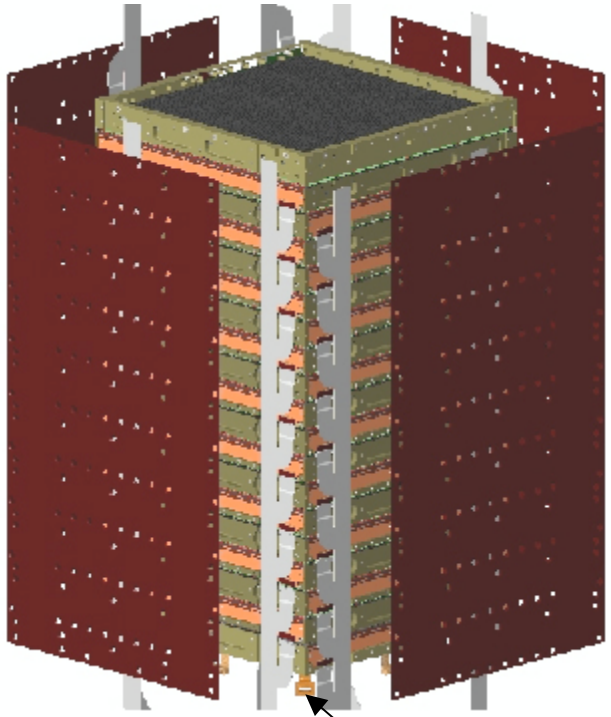
Stanford Linear Accelerator Center

Design and System Engineering

- **Design Engineering**
  - Hardware design
  - Analysis and Documentation
  - Qualification and verification
  - Manufacturing of the flight hardware
  - Alignment and Clearance
  - Coupled loads analysis
  - Design and construction of the GSE
  - Design Trades
  - Cost and Schedule
  - Traceability
- **System Engineering**
  - Requirements Analysis
    - Flowdown
    - Allocation
    - Reviews
  - Environmental Specs
  - System Control
    - Risk, Configuration and Interface Management
    - Metrics and Reviews
  - External interfaces
    - Spacecraft, Mission
    - Command and Telemetry

Issue – Tracker Bottom Tray Design 1 of 4

Tracker Module



Mounting Flexure

Issue – Tracker Bottom Tray Design – 2 of 4

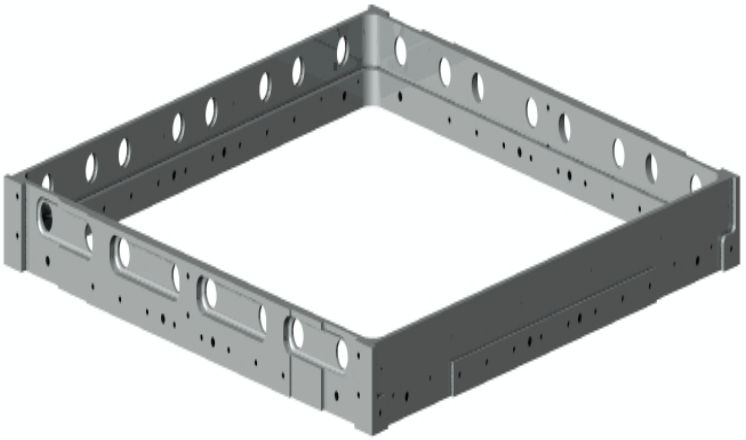
- Issue
  - Crack formed in the bottom tray during a vibration test of a pre-engineering model
- Resolution
  - Anomaly Review Team (ART) formed
    - Analyzed the failure
- Present status
  - Two parallel paths
    - Invar bottom tray
      - "Bullet Proof"
      - Matches thermal coefficient but is magnetic
    - Reinforce Corners
      - Requires further analysis and testing

Issue – Tracker Bottom Tray Design 3 of 4

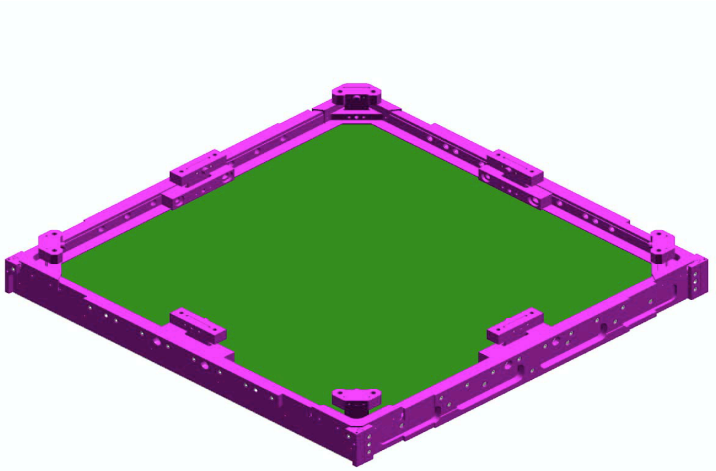
- **Schedule**
  - Resolve Invar magnetic issues by end of October '02
    - Effect on ACD phototubes
    - Effect on Spacecraft magnetometers and torque rods
  - In the meantime, check availability of alternate material for the redesign
  - Complete proposal for the design and analysis of the corner reinforcement design by end of October '02
  - In either case be ready for a design review and begin construction of the EM bottom tray by the middle of December '02 (Rest of EM proceeding independently)
  - Test a full size mechanical EM before the CDR in April '03

Issue – Tracker Bottom Tray Design 4 of 4

Parallel Paths



INVAR Bottom Tray



Corner Gussets

Issue – Calorimeter Photodiodes 1 of 3

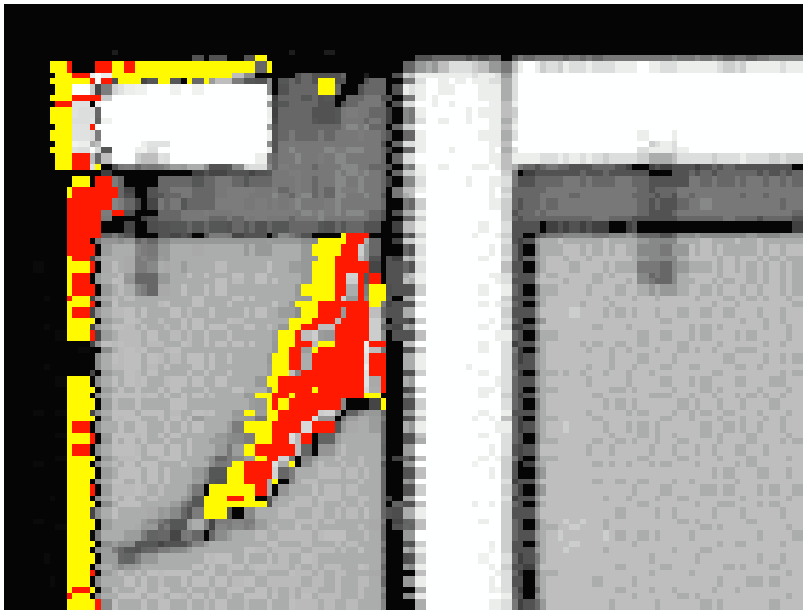
- Issue
  - Bond failure and cracking of the photodiode epoxy encapsulant
- Resolution
  - Switch to a silicone elastomer encapsulant
    - Testing commercial version
  - Hamamatsu is investigating modifying mix ratios to produce a softer epoxy
- Present Status
  - Elastomer commercial version received and thermal cycled successfully
  - Hamamatsu developing a timeline with early procurement of low risk items – ceramic carriers and silicon die

Issue – Calorimeter Photodiodes 2 of 3

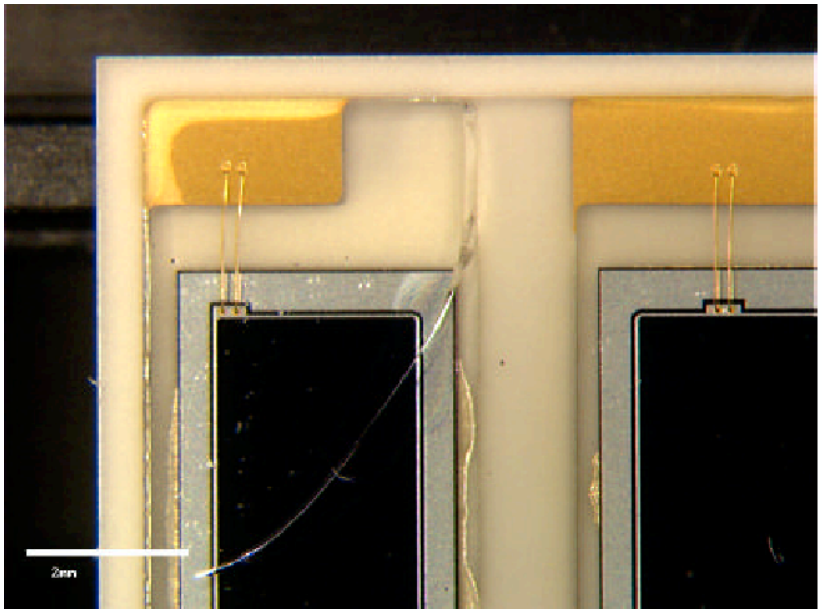
- **Schedule**
  - **Plans depend on tests of elastomer units and Hamamatsu's response to a time line with early procurements**
  - **Still possible to meet the CDR deadline but at high risk**

Issue – Calorimeter Photodiodes 3 of 3

- **Acoustic Microscopy**



- **Optical Image**



Issue – ASICs

- **Issue**
  - **Concern about the timely availability of final versions of the ASICS**
- **Present Status and Schedule**

ASIC		FH Proc	Working	Proto	EM	Notes
GTFE	TKR	Dec-02	Yes		Yes	Oscillates, noise being investigated
GTRC		Dec-02	Yes		Yes	Parity Bit and multihit TOT
GCFE	CAL	Sep-02	Yes		Yes	
GCRC		Sep-02	Yes		Yes	
GAFE	ACD	Mar-03		Nov-02		Not fully functional
GARC		Mar-03	Yes	Nov-02		
GLCC	LAT	Aug-03		Sep-02		2 more prototype cycles
GTCC		Aug-03		Nov-02		2 more prototype cycles
GCCC		Aug-03		Nov-02		2 more prototype cycles
Notes:	1	Dates are when the design is submitted for fabrication				
	2	"Working" means that the existing design could be used for flight but there are known limitations that can be overcome by another design cycle				

Other Issues

1. Finalize Spacecraft Interface
2. Environmental Specification
3. CAL – GRID interface
4. Test Instrumentation
5. Test Plans

Scope of the design effort

- Expect 100% Documentation Released by LAT CDR
  - Signed off, in Cyberdocs and under Configuration Management
  - Exceptions <10% of the total
  - Need action plan for releasing the exceptions
- Documentation includes
  - All Engineering Drawings
  - All Process Control Documentation
  - Manufacturing procedures
- All Parts, Materials, and Processes must be on the LAT Approved List

Scope of the design effort

- 500 to 1000 Engineering Drawings
  - 25 Weeks to CDR
  - 20 to 40 Engineering Drawings Released per Week
- 200 to 500 Manufacturing procedures
  - 8 to 20 Procedures Released per Week
- Complete Drawing Tree by end of November
  - Determine Status and Monitor progress
  - Includes all electrical and mechanical drawings
- Initial Materials and Processes List by the end of November
- Develop a list of planned PRRs
- Need to review the Configuration Management procedure

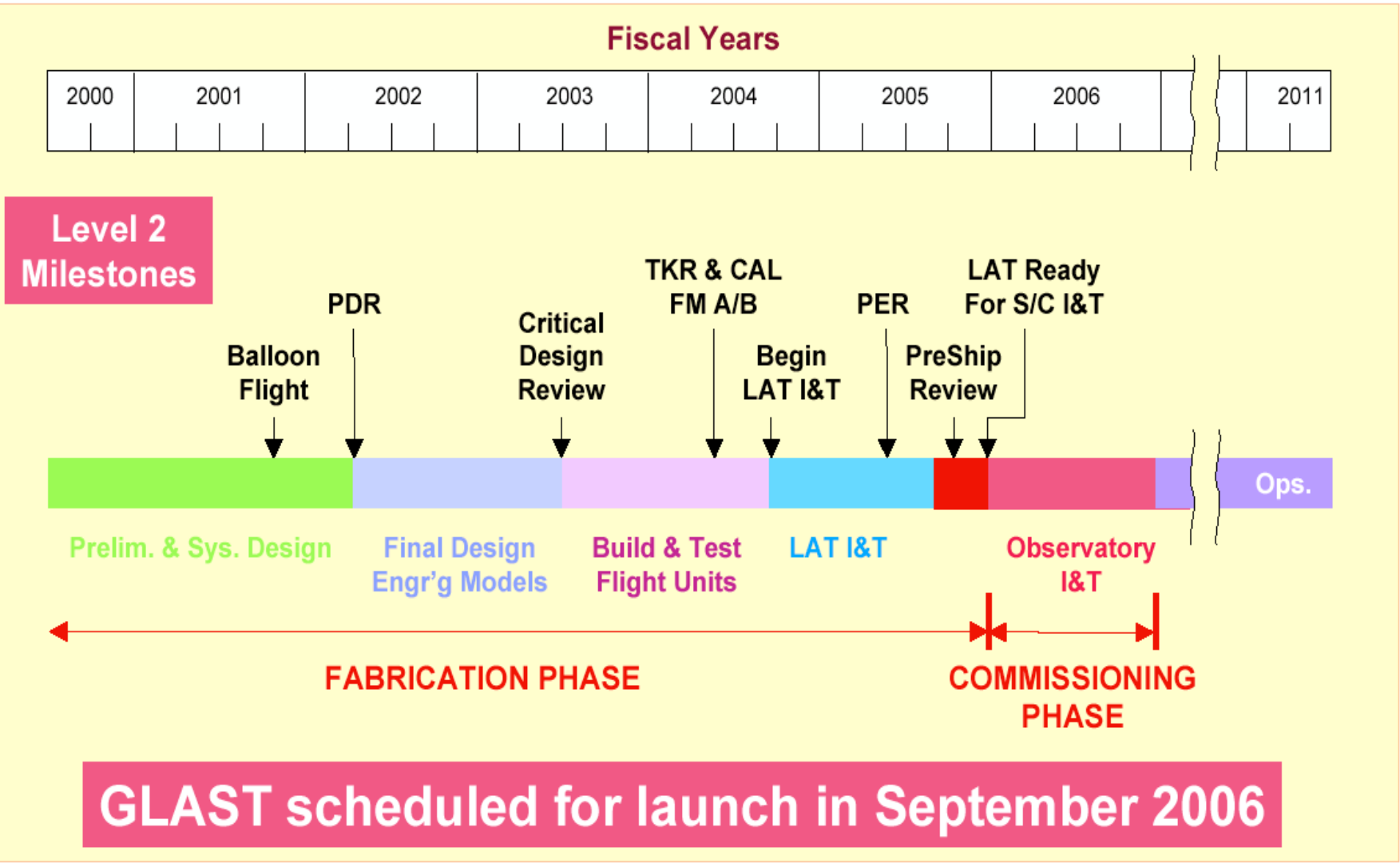
EM Deliverables to I&T

- **ACD – none**
- **TKR - one full size mechanical module and a four-tray module fully instrumented (1 with W, 2 No-W and 1 bottom tray) with cables and electronic readout (mini-tower), TKR lift fixture, preliminary functional test scripts**
- **CAL – fully instrumented module, preliminary functional test scripts**
- **ELX/I&T - EGSE – EM1 version**
- **ME/I&T - 1 x 4 support grid**
- **SAS/I&T - GLEAM Monte Carlo, calibration algorithms**

EM Delivery Schedule

Subsystem/Hardware	Delivery to I&T (baseline dates)	Delivery back to subsystem
ME – EM/CU Grid	December 2, 2002	Not required
TKR – EM Mechanical Model	December 9, 2002	Not required
TKR – EM live mini-tower	February , 2003 (not in baseline)	Not required
ELX – EGSE Hardware	February 2003	Not required
CAL – EM Calorimeter	April 25, 2003	June 6, 2003

Schedule


Fiscal Years
2000
2001
2002
2003
2004
2005
2006
2011
Level 2 Milestones
Balloon Flight
PDR
Critical Design Review
TKR & CAL FM A/B
Begin LAT I&T
PER
PreShip Review
LAT Ready For S/C I&T
Ops.
Prelim. & Sys. Design
Final Design Engr'g Models
Build & Test Flight Units
LAT I&T
Observatory I&T
FABRICATION PHASE
COMMISSIONING PHASE
GLAST scheduled for launch in September 2006

Spacecraft Vendor

SPECTRUMASTRO

Arizona California Colorado Virginia Washington D.C.

1440 N. Fiesta Blvd. • Gilbert, AZ 85233 • Phone 480.892.8200 • FAX 480.892.2949

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Summary

- The Management Team is in place
- A Spacecraft Vendor has been chosen
- The Project has passed the NASA Preliminary Design Review
- The Project has passed the DOE CD-2 Review
- The Project is in the detailed design and test phase

- There are significant technical challenges
- Most systems and procedures are not in place
- Cost and schedule are very tight
- Focusing on a successful Critical Design Review in April '03